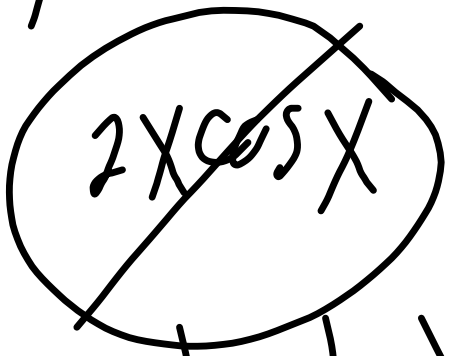
3.3 b more rules for derivatives

Product rule

ex $\frac{d}{dx} x^2 \sin x = x^2 \cos x + 2x \sin x$



der of product ≠ product of der.

product rule

$$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$$

u, v are functions of x

$$\frac{d}{dx}\left(x^3+2x\right)\cos x =$$

$$\left(x^3+2x\right)\left(-\sin x\right) + \cos x\left(3x^2+2\right)$$

$$\frac{d}{dx}\left(x^2 \sin x \cos x\right) =$$

$$x^2\sin x\cdot\left(-\sin x\right) + \cos x\cdot\left(x^2\cos x + \sin x\cdot 2x\right)$$

$$\frac{d}{dx}\underbrace{(x^2+2x+1)}_{u}\overbrace{(x^3+7)}^{v}=$$

$$(x^2+2x+1)3x^2+(x^3+7)(2x+2)$$

$$u\frac{dv}{dx}+v\frac{du}{dx}$$

Quotient Rule p 120

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$$

$$\frac{d}{dx}\left(\frac{x^3}{\sin x}\right) = \frac{\sin x \cdot 3x^2 - x^3 \cos x}{(\sin x)^2}$$

$$\sin^2 x = (\sin x)^2$$

$$\frac{d}{dx}\frac{x^2-1}{x^2+1} = \frac{(x^2+1)2x-(x^2-1)2x}{(x^2+1)^2}$$

$$\frac{d}{dx}\frac{x^2\sin x}{x^3+2} =$$

$$\frac{(x^3+2)(x^2\cos x+\sin x\cdot 2x)-x^2\sin x\cdot 3x^2}{(x^3+2)^2}$$

3.4 a

position $s = f(t)$

velocity $\frac{ds}{dt} = f'(t)$

acceleration $\frac{d^2s}{dt^2} = f''(t)$

speed $= |\text{velocity}|$

read 4, 5

$s = t^2 - 4t + 3$

c) $v = 2t - 4 \Big|_{t=4} = 2 \cdot 4 - 4 = 4$

d) $a = 2$

f) parametric $x = \}$ functions of t
$y = \}$

graphs & geometry,